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A threshold analysis to use CSRF data for storm impact studies

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Storms are a threat to the stability of a power system, especially when the wind power penetration is high. The purpose of this study is to investigate how wind power behaves in relation to storms in the Nordic countries, particularly in Denmark, and to assess the validity of using CSFR reanalysis data for the task. The investigated behaviours include the power curve and the wind power response to the temporal and spatial smoothing effects. In this study, a new method was developed, that relies on the contribution of the measured wind power data and modelled winds from the CSFR reanalysis. This method was developed to identify the corresponding "cut-out" wind speed through developing a regional power curve using measured wind power and global reanalysis data. This cut-out speed is found to be dependent on the region and the spatial and temporal resolution of the data analysed.

Through this method, the key parameter, the "cut-out" wind speed for a particular model product (here the CSFR data) can be identified and further used to access the climatological storm statistics. This study demonstrates that the regional and country scale wind power during storm conditions is significantly affected by the spatial and temporal smoothing effect.